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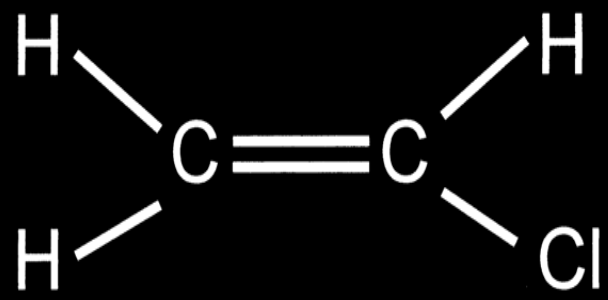
The Vinyl Chloride Surveillance Program



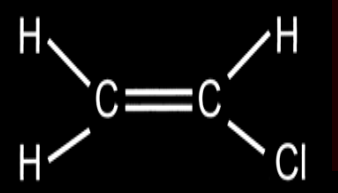
The University of Louisville

Richard Lewis, MD, MPH

History of “Rubbertown”

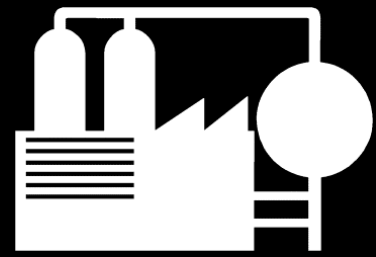
BFGoodrich Complex

- Plastics and synthetic rubber production began in the 1940’s
- BF Goodrich: Vinyl chloride (VC) and Polyvinyl chloride (PVC)
- Adjacent Government plant produced Nitrile Rubber (NBR)
- Acquired in 1950 to form complex



VINYL CHLORIDE

- Gas at room temperature
- Low irritant properties
- Polymerization reactions incomplete
- Reactors needed to be entered for cleaning
- Ventilation/respiratory protection limited

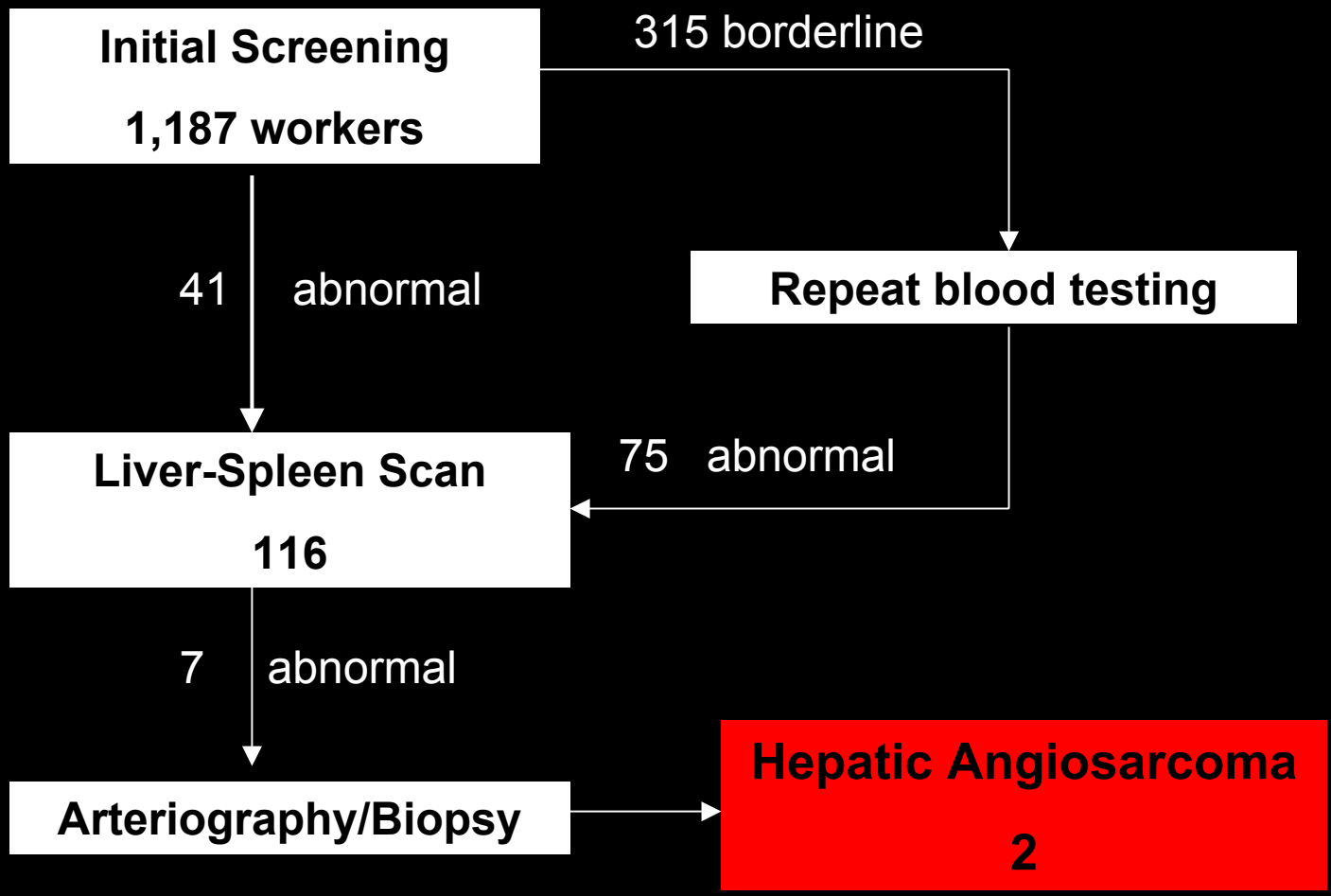


Historical Landmarks

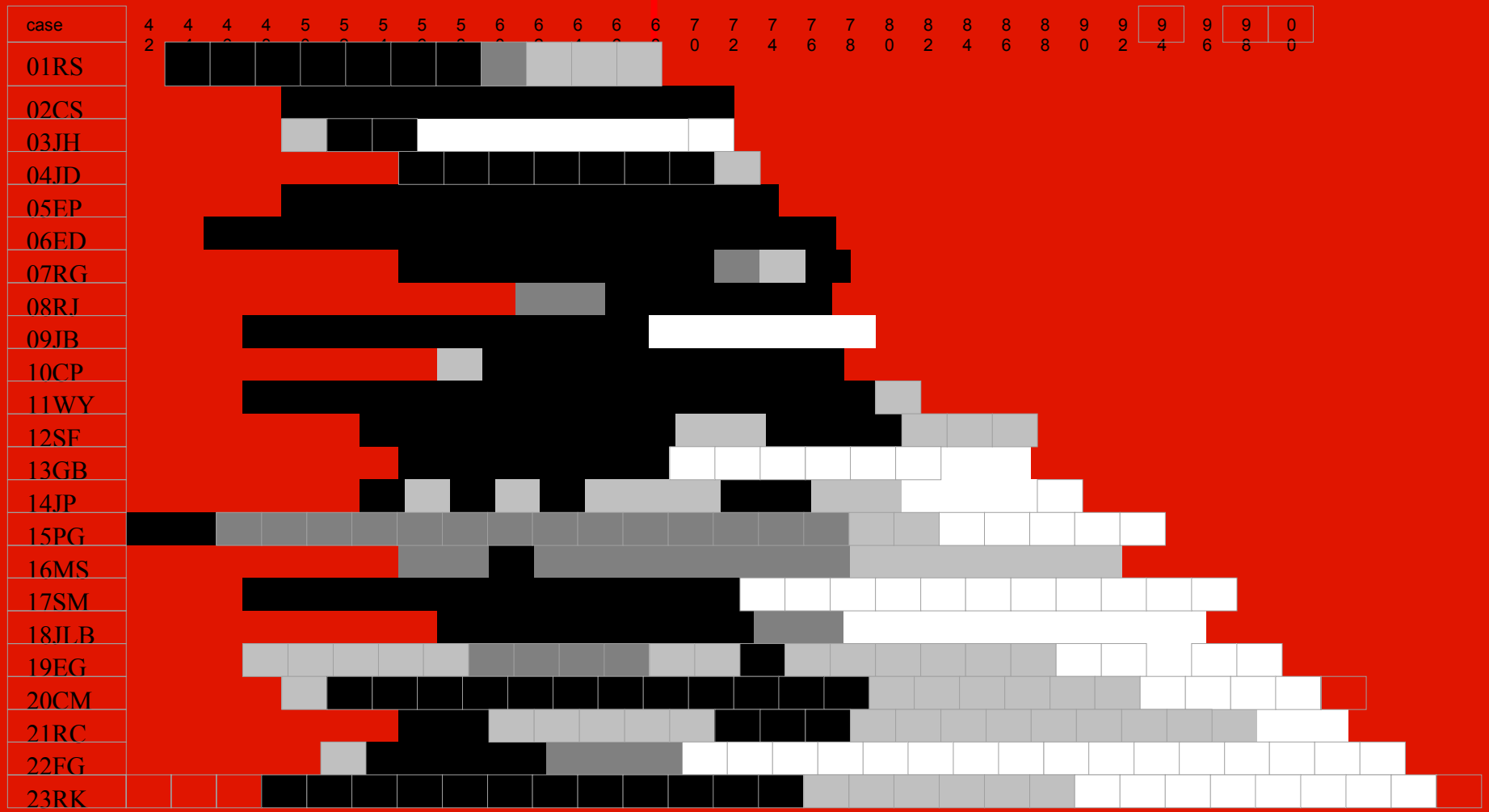
- **P**roduction of PVC boomed in the 1950's
- Plant employed 1,000 persons on average
- Acro-osteolysis in 1960's drew attention to hazard
- On-site physician was local surgeon
- 3 cases of hepatic angiosarcoma in 1970's
- Industry acknowledged condition publicly/internationally
- NCI Grant for to *UofL* for development of comprehensive cancer surveillance program

Medical Surveillance Examinations

First Year Results 1976-77



VC Exposure Intensity and Latency
23 Cases of Hepatic Angiosarcoma



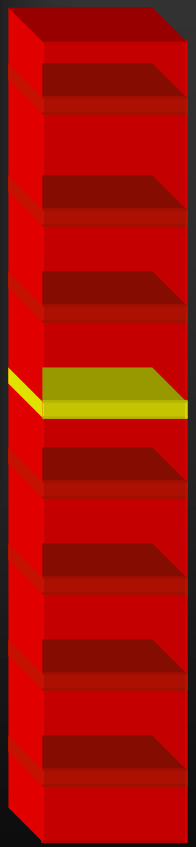
RANKING SCALES USED FOR EXPOSURES AT THE LOUISVILLE PLANT

RANK	DESCRIPTION
0	Absent from Environment
1	Lowest Exposure
2	Minimal Exposure to Low Levels
3	Moderate Exposure
4	Works in Area Subject to High Occupational Exposures
5	Works in Areas Where Level is High
6	Intimate Contact – Skin Exposure or High Inhalation

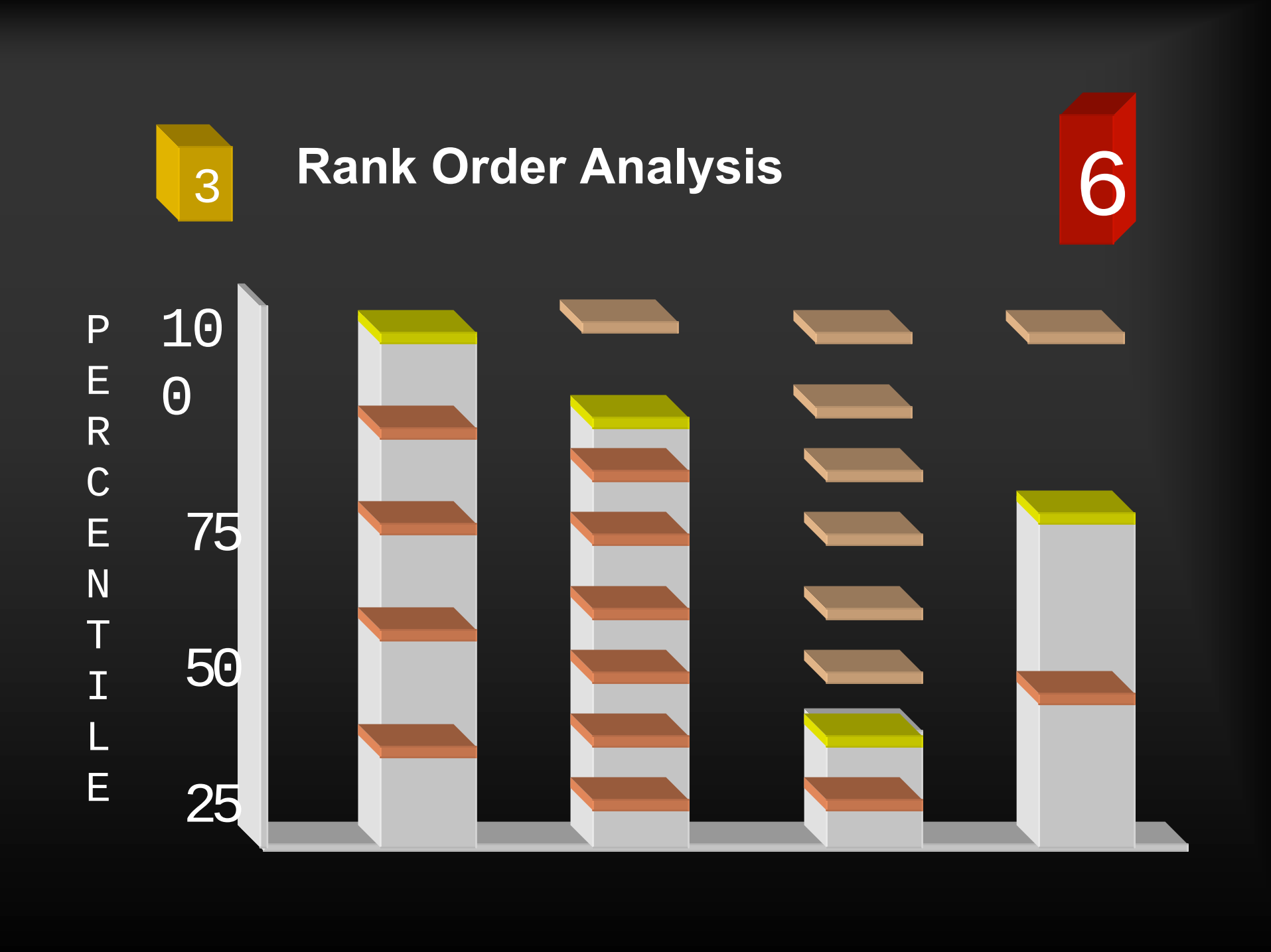
Chemicals Ranked at the Louisville Plant

- Acrylic Acid
- Acrylamides
- Acrylonitrile
- Acetylene
- Acrylates
- Bisphenol A
- Butadiene
- Caprylyl Chloride
- Chlorinated Solvents
- Chloro Ethyl Vinyl Ether
- Diethyl Maleate
- Mercuric Chloride
- Methanol
- Phenol
- Toluene
- Vinyl Chloride
- Vinylidene Chloride
- Vinyl Acetate
- PVC Dust
- Catalysts
- Styrene
- Hexane

Rank Order Analysis

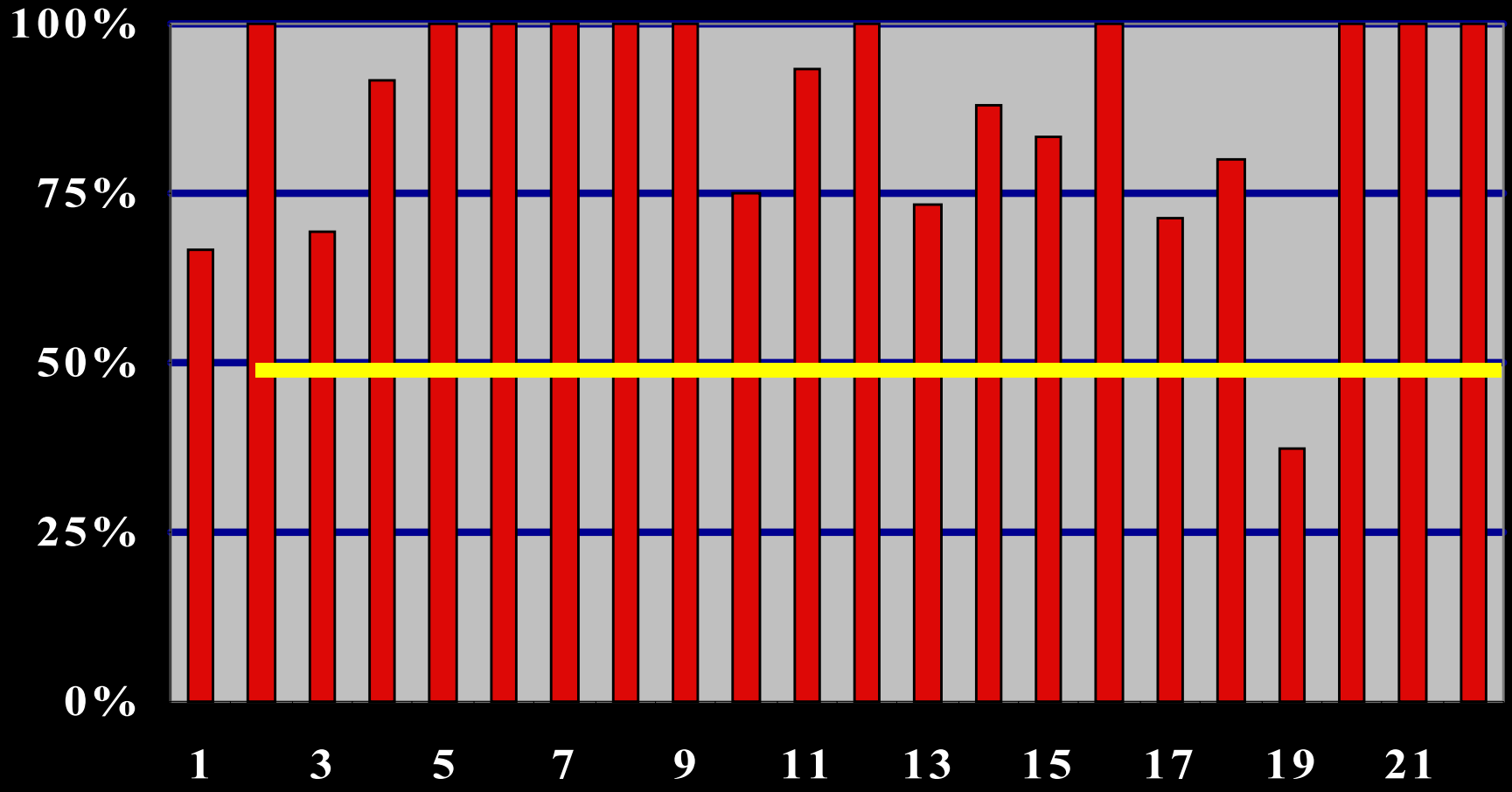


- Method for the analysis of ordinal data in case-control studies (Cusick,1985)
- Useful when cases are limited
- Case and respective controls form a stratum
- Case is ranked by exposure variable
- Analysis of the weighted sum of the case-percentile ranks in each stratum
- CERM = cumulative exposure rank X months

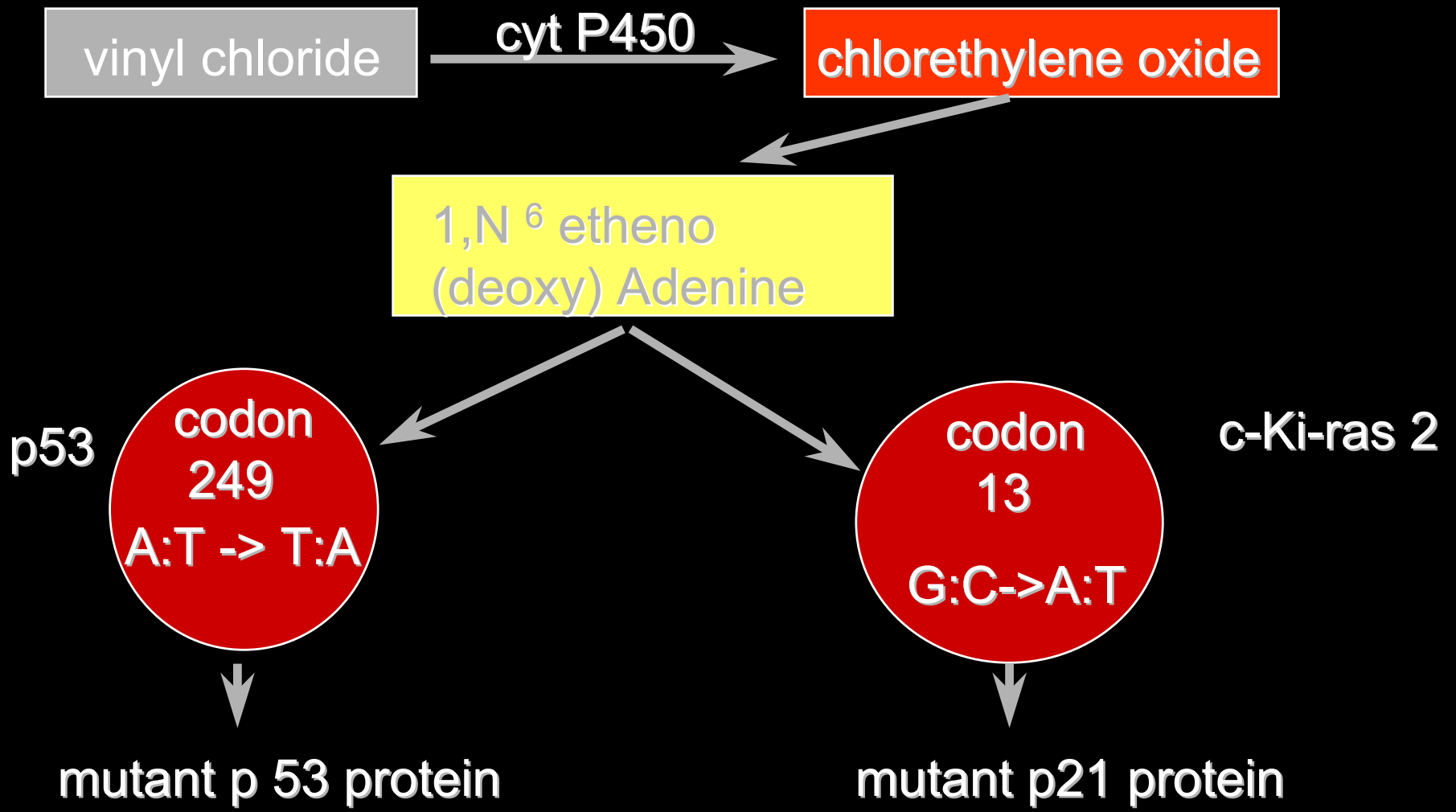

3
Rank Order Analysis
6
PERCENTILE
100
75
50
25

Percentile Ranks of 22 Cases of Hepatic Angiosarcoma

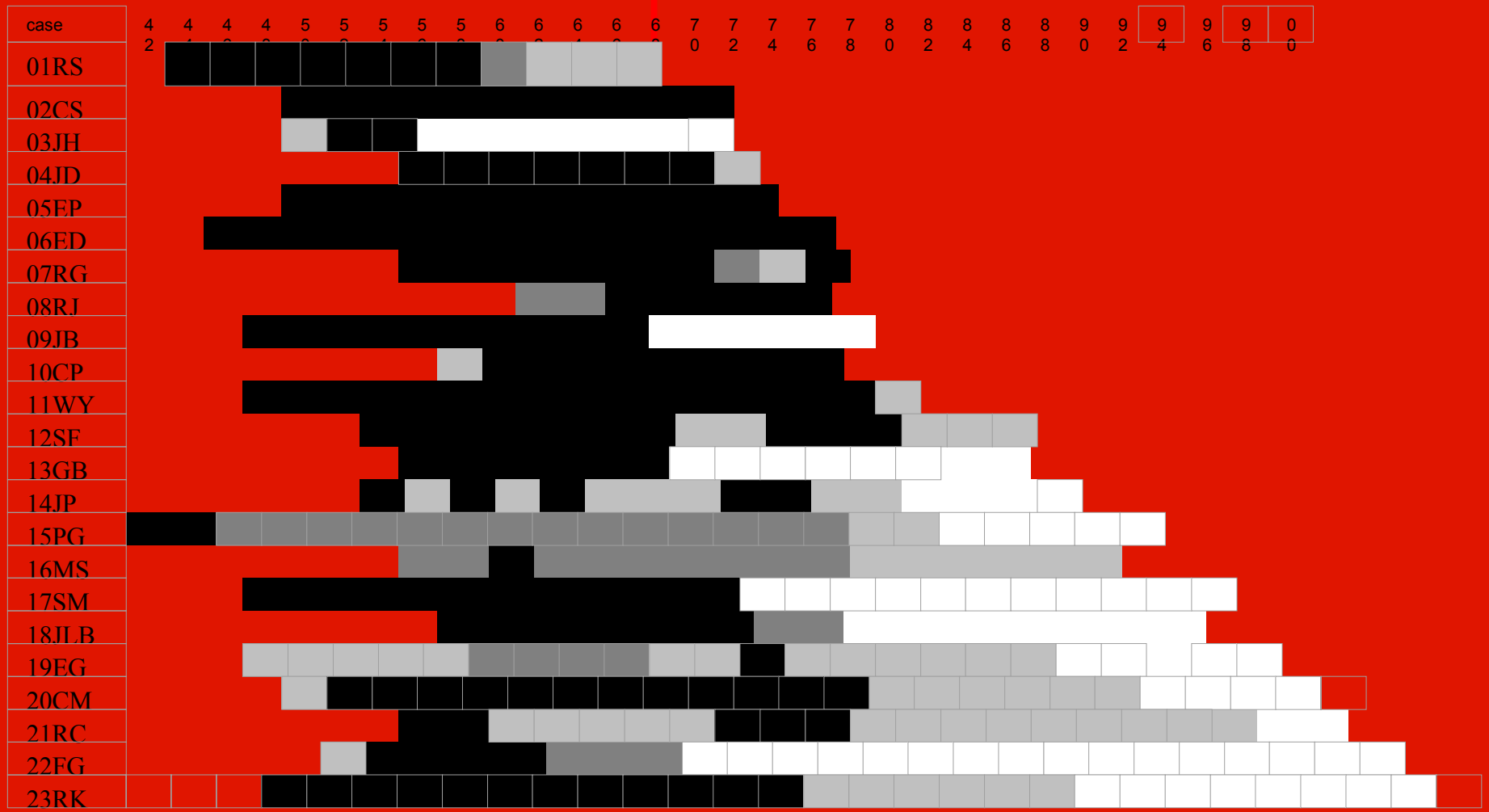
Ordered by Cumulative Exposure-Rank Months to VC



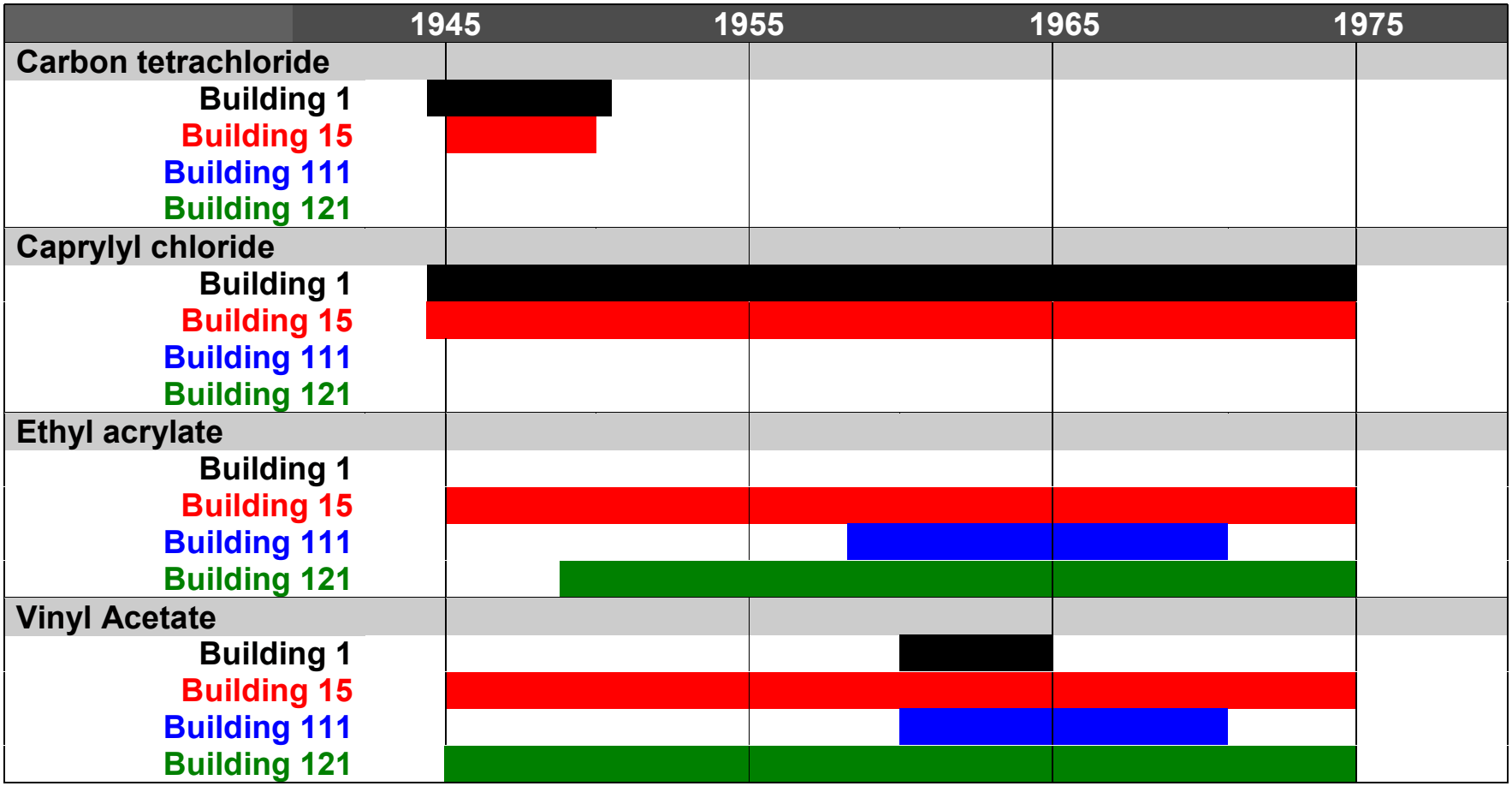
Genetic Toxicology of Vinyl Chloride



VC Exposure and Latency
23 Cases of Hepatic Angiosarcoma



Chemicals Used in PVC production



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Resources
Occupational Toxicology

- Three surveillance cohorts (BFG, Zeon, Sud Chemie)
- 35,000 encounters (medical histories/vitals)
- Biological specimen bank
  - 3,500 serum specimens from 1975-81
  - 3,000 serum specimens from 1990 – present
- 150 liver biopsy slides/blocks
- 160 heart catheterizations (1975)
- 22,000 cholesterols/7,000 HDL
- 8,000 electrocardiograms

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Active Research Projects
Occupational Toxicology

- Mortality study of 2,500 workers
- Case-control study of brain cancer
- NIOSH Grant to evaluated Inhibin B as marker of testicular toxicity
- Evaluation of p53 Biomarker with NIH
- Evaluation of markers of sinusoidal injury
- Detailed assessment of exposures of angiosarcoma cases

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Research Prospects
Occupational Toxicology

- Further elucidation of molecular mechanisms of vinyl chloride induced angiosarcoma
- Exposure to chemical mixtures
- Brain cancer epidemiology
- Occupational lung disease
- Brain cancer epidemiology
- Lung cancer